that in 1998, the median annual income of engineering department managers and superintendents was $85,600; the corresponding figure for research and development managers was about $75,400.

In addition, engineering, natural science, and computer and information systems managers, especially those at higher levels, often receive more benefits—such as expense accounts, stock option plans, and bonuses—than non-managerial workers in their organizations.

**Related Occupations**

The work of engineering, natural science, and computer and information systems managers is closely related to that of engineers, life scientists, physical scientists, computer professionals, and mathematicians. It is also related to the work of other managers, especially general managers and top executives.

**Sources of Additional Information**

For information about a career as an engineering, natural science, or computer and information systems manager, contact the sources of additional information for engineers, life scientists, physical scientists, and computer occupations that are listed in statements on these occupations elsewhere in the *Handbook*.

## Farmers and Farm Managers

(O*NET 79999C, 79999D, 79999G, 79999J, 79999K, 79999L, and 79999M)

### Significant Points

- Modern farming requires a combination of formal education and work experience, sometimes acquired through growing up on a farm or through internships now becoming available.
- Overall employment is projected to decline because of increasing productivity and consolidation.
- New developments in marketing and organic farming are making small-scale farming economically viable again.

**Nature of the Work**

American farmers and farm managers direct the activities of one of the world's largest and most productive agricultural sectors. They produce enough food and fiber to meet the needs of our Nation and for export.

*Farmers* may be owners or tenants who rent the use of land. The type of farm they operate determines their specific tasks. On crop farms—farms growing grain, cotton, and other fibers, fruit, and vegetables—farmers are responsible for planning, tilling, planting, fertilizing, cultivating, spraying, and harvesting. After the harvest, they make sure the crops are properly packaged, stored, or marketed. Livestock, dairy, and poultry farmers must feed, plan, and care for the animals and keep barns, pens, coops, and other farm buildings clean and in good condition. They also oversee breeding and marketing activities. Horticultural specialty farmers oversee the production of ornamental plants, nursery products—such as flowers, bulbs, shrubbery, and sod—and fruits and vegetables grown in greenhouses. Aquaculture farmers raise fish and shellfish in marine, brackish, or fresh water, usually in ponds, floating net pens, raceways, or recirculating systems. They stock, feed, protect, and otherwise manage aquatic life sold for consumption or used for recreational fishing.

Farmers make many managerial decisions. Their farm output is strongly influenced by the weather, disease, fluctuations in prices of domestic and foreign farm products, and Federal farm programs. In a crop operation, farmers usually determine the best time to plant seed, apply fertilizer and chemicals, harvest, and market. They use different strategies to protect themselves from unpredictable changes in the markets for agricultural products. Many farmers carefully plan the combination of crops they grow so if the price of one crop drops, they will have sufficient income from another to make up for the loss. Others, particularly operators of smaller farms, may choose to sell their goods directly through farmers' markets, or use cooperatives to reduce their financial risk. For example, Community Supported Agriculture (CSA) is a cooperative where consumers buy shares of a harvest prior to the planting season, thus freeing the farmer from having to bear all the financial risks.

*Farmer works with technician to test dairy herd for butterfat content of milk.*

Farmers who plan ahead may be able to store their crops or keep their livestock to take advantage of better prices later in the year. Those who participate in the futures market—where contracts and options on futures contracts on commodities are traded through stock brokers—try to anticipate or track changes in the supply of and demand for agricultural commodities, and thus changes in the prices of farm products. By buying or selling futures contracts, or by pricing their products in advance of future sales, they attempt to either limit their risk or reap greater profits than would normally be realized. They may have to secure loans from credit agencies to finance the purchase of machinery, fertilizer, livestock, and feed. Farming operations have become more complex in recent years, so many farmers use computers to keep financial and inventory records. They also use computer databases and spreadsheets to manage breeding, dairy, and other farm operations.

Farmers' tasks range from caring for livestock, to operating machinery, and to maintaining equipment and facilities. The size of the farm often determines which of these tasks farmers will handle themselves. Operators of small farms usually perform all tasks, physical and administrative. They keep records for tax purposes, service machinery, maintain buildings, and grow vegetables and raise animals. Operators of large farms have employees who help with the physical work that small-farm operators do themselves. Although employment on most farms is limited to the farmer and one or two family workers or hired employees, some large farms have 100 or more full-time and seasonal workers. Some of these employees are in nonfarm occupations, working as truckdrivers, sales representatives, bookkeepers, and computer specialists.

*Farm managers* guide and assist farmers and ranchers in maximizing the financial returns to their land by managing the day-to-day activities. Their duties and responsibilities vary widely. For example, the owner of a very large livestock farm may employ a farm manager to oversee a single activity, such as feeding livestock. On the other hand, when managing a small crop farm for an absentee owner, a farm manager may assume responsibility for all functions, from selecting the crops to participating in planting and harvesting. Farm management firms and corporations involved in agriculture employ highly trained professional farm managers who may manage farm operations or oversee tenant operators of several farms. In these cases, farm managers

may establish output goals; determine financial constraints; monitor production and marketing; hire, assign, and supervise workers; determine crop transportation and storage requirements; and oversee maintenance of the property and equipment.

**Working Conditions**

The work of farmers and farm managers is often strenuous, their work hours are frequently long, and their days off during the planting, growing, and harvesting seasons are rare. Nevertheless, for those who enter farming, these disadvantages are outweighed by the opportunities for living in a rural area, working outdoors, being self-employed, and making a living working the land. Farmers and farm managers on crop farms usually work from sunrise to sunset during the planting and harvesting seasons. During the rest of the year they plan next season's crops, market their output, and repair machinery; some may earn additional income by working a second job off the farm.

On livestock producing farms, work goes on throughout the year. Animals, unless they are grazing, must be fed and watered every day, and dairy cows must be milked two or three times a day. Many livestock and dairy farmers monitor and attend to the health of their herds, which may include assisting birthing animals. Such farmers rarely get the chance to get away unless they hire an assistant or arrange for a temporary substitute.

Farmers who grow produce and perishables have different demands on their time. For example, organic farmers must maintain cover crops during the cold months, which keeps them occupied with farming beyond the typical growing season.

Farm work also can be hazardous. Tractors and other farm machinery can cause serious injury and workers must be constantly alert on the job. The proper operation of equipment and handling of chemicals is necessary to avoid accidents and protect the environment.

On very large farms, farmers spend substantial time meeting with farm managers or farm supervisors in charge of various activities. Professional farm managers overseeing several farms may divide their time between traveling to meet farmers or landowners and planning the farm operations in their offices. As farming practices and agricultural technology become more sophisticated, farmers and farm managers are spending more time in offices and at computers, where they electronically manage many aspects of their businesses. Some farmers also spend time at conferences, particularly during the winter months, trading information.

**Employment**

Farmers and farm managers held nearly 1.5 million jobs in 1998. About 88 percent were self-employed farmers. Most farmers manage crop production activities while others manage livestock and dairy production. A relatively small number were involved in agricultural services, such as contract harvesting and farm labor contracting.

The soil, topography of the land, and the climate of an area generally determine the type of farming done. For example, wheat, corn, and other grains are most efficiently grown on large farms on level land where large, complex machinery can be used. Thus, these crops are prevalent on the prairies and plains of Iowa, Illinois, Indiana, Nebraska, Ohio, Kansas, and southern Minnesota and Wisconsin. Crops requiring longer growing seasons, such as cotton, tobacco, and peanuts, are grown chiefly in the South. Most of the country's fruits and vegetables come from California, Texas, and Florida. Many dairy herds are found in the areas with good pasture land, such as Wisconsin, New York, and Minnesota. However, in recent years dairy farming has expanded rapidly in California, Arizona, and Texas.

**Training, Other Qualifications, and Advancement**

Growing up on a family farm and participating in agricultural programs for young people (sponsored by the National Future Farmers of America Organization or the 4-H youth educational programs) are important sources of training for those interested in pursuing agriculture as a career. However, modern farming requires increasingly complex scientific, business, and financial decisions. Therefore, even people who were raised on farms must acquire the appropriate education.

Not all farm managers grew up on farms. For these people, a bachelor's degree in business with a concentration in agriculture is important. In addition to formal education, they need several years of work experience in the different aspects of farm operations in order to qualify for a farm manager position.

Students should select the college most appropriate to their specific interests and location. In the United States, all State university systems have one land-grant university with a school of agriculture. Common programs of study include agronomy, dairy science, agricultural economics and business, horticulture, crop and fruit science, and animal science. For students interested in aquaculture, formal programs are available, and include coursework in fisheries biology, fish culture, hatchery management and maintenance, and hydrology. Whatever one's interest, the college curriculum should include courses in agricultural production, marketing, and economics.

Professional status can be enhanced through voluntary certification as an Accredited Farm Manager (AFM) by the American Society of Farm Managers and Rural Appraisers. Certification requires several years of farm management experience, the appropriate academic background—a bachelor's degree or preferably a master's degree in a field of agricultural science—and passing courses and examinations relating to business, financial, and legal aspects of farm management.

Farmers and farm managers need to keep abreast of continuing advances in farming methods both in the United States and abroad. Besides print journals that inform the agricultural community, the spread of the Internet and the World Wide Web allows quick access to the latest developments in areas such as agricultural marketing, legal arrangements, or growing crops, vegetables and livestock. Electronic mail, on-line journals and newsletters from agricultural organizations also speed the exchange of information directly between farming associations and individual farmers.

Farmers must also have enough technical knowledge of crops, growing conditions, and plant diseases to make decisions ensuring the successful operation of their farms. A rudimentary knowledge of veterinary science, as well as animal husbandry, is important for livestock and dairy farmers. Knowledge of the relationship between farm operations—for example, the use of pesticides—and environmental conditions is essential. Mechanical aptitude and the ability to work with tools of all kinds are also valuable skills for the operator of a small farm, who often maintains and repairs machinery or farm structures.

Farmers and farm managers need the managerial skills necessary to organize and operate a business. A basic knowledge of accounting and bookkeeping is essential in keeping financial records, while a knowledge of credit sources is vital for buying seed, fertilizer, and other inputs necessary for planting. Farmers and farm managers must also be familiar with complex safety regulations and requirements of governmental agricultural support programs. Computer skills are increasingly important, especially on large farms, where computers are widely used for recordkeeping and business analysis. For example, some farmers use personal computers to access the Internet to get the latest information on prices of farm products and other agricultural news.

High school training should include courses in mathematics and biology and other life sciences. Completion of a 2-year and preferably a 4-year bachelor's degree program in a college of agriculture is becoming increasingly important. But even after obtaining formal education, novices may need to spend time working under an experienced farmer to learn how to put to practice the skills learned through academic training. A small number of farms offer, on a formal basis, apprenticeships to help young people acquire such practical skills.

**Job Outlook**

The expanding world population is increasing the demand for food and fiber. Demand for U.S. agricultural exports of beef, poultry, and feed grain is expected to grow in the long run as developing nations improve their economies and personal incomes. However, increasing

productivity in the highly efficient U.S. agricultural production industry is expected to meet domestic consumption needs and export requirements with fewer workers. Employment of farmers and farm managers is expected to continue to decline through the year 2008. The overwhelming majority of job openings will result from the need to replace farmers who retire or leave the occupation for economic or other reasons.

Market pressures will continue the long-term trend toward consolidation into fewer and larger farms over the 1998-2008 period, further reducing the number of jobs for farmers and farm managers. Some farmers acquire farms by inheritance; however, purchasing a farm or additional land is expensive and requires substantial capital. In addition, sufficient funds are required to withstand the adverse effects of climate and price fluctuations upon farm output and income and to cover operating costs—livestock, feed, seed, and fuel. Also, the complexity of modern farming and keen competition among farmers leaves little room for the marginally successful farmer.

Despite the expected continued consolidation of farm land and the projected decline in overall employment of farmers and farm managers, an increasing number of small-scale farmers have developed successful market niches that involve personalized, direct contact with their customers. Many are finding opportunities in organic food production, as more consumers demand food grown without pesticides or chemicals. Others use farmers' markets that cater directly to urban and suburban consumers, allowing the farmers to capture a greater share of consumers' food dollar. Some small-scale farmers, such as some dairy farmers, belong to collectively owned marketing cooperatives that process and sell their product. Other farmers participate in Community Supported Agriculture cooperatives that allow consumers to directly buy a share of the farmer's harvest.

Aquaculture should also continue to provide some new employment opportunities over the 1998-2008 period. Overfishing has resulted in declining ocean catches, and the growing demand for certain seafood items—such as shrimp, salmon, and catfish—has spurred the growth of aquaculture farms. Aquaculture output increased strongly between 1983 and the mid-1990s. Efforts to produce more farm-raised fish and shellfish should continue to increase in response to demand growth.

**Earnings**

Farmers' incomes vary greatly from year to year because prices of farm products fluctuate depending upon weather conditions and other factors that influence the amount and quality of farm output and the demand for those products. A farm that shows a large profit in one year may show a loss in the following year. Under the 1996 Farm Act, Federal Government subsidy payments, which have traditionally shielded some grain producers from the ups and downs of the market, were set at fixed levels regardless of yields or prices. Consequently, these farmers may experience more income variability from year to year than in the past. The Act also phases out price supports for dairy farmers, and may result in lower incomes for dairy producers. Many farmers—primarily operators of small farms—have income from off-farm business activities, often greater than that of their farm income.

Full-time, salaried farm managers, with the exception of horticultural managers, had median weekly earnings of $447 in 1998. The middle half earned between $302 and $619. The highest paid 10 percent earned more than $852 and the lowest paid 10 percent earned less than $220. Horticultural specialty farm managers generally earn considerably more.

Farmers and self-employed farm managers make their own provisions for benefits. As members of farm organizations, they may derive benefits such as group discounts on health and life insurance premiums.

**Related Occupations**

Farmers and farm managers strive to improve the quality of agricultural products and the efficiency of farms. Workers with similar functions include agricultural engineers, animal breeders, animal scientists, county agricultural agents, dairy scientists, extension service specialists, feed and farm management advisors, horticulturists, plant breeders, and poultry scientists.

**Sources of Additional Information**

For general information about farming and agricultural occupations, contact:

☛ Center for Rural Affairs, P.O. Box 46, Walthill, NE 68067.

For information about certification as an accredited farm manager, contact:

☛ American Society of Farm Managers and Rural Appraisers, 950 Cherry St., Suite 508, Denver, CO 80222. Internet: **http://www.agri-associations.org**

For information on aquaculture, education, training, or Community Supported Agriculture, contact:

☛ Alternative Farming System Information Center (AFSIC), National Agricultural Library USDA, 10301 Baltimore Ave., Room 304, Beltsville, MD 20705-2351. Internet: **http://www.nal.usda.gov/afsic**

☛ Appropriate Technology Transfer for Rural Areas, P.O. Box 3657, Fayetteville, AR 72702. Internet: **http://www.attra.org/attra-pub/atmatlst.html#resource**

For general information about farm occupations, opportunities, and 4-H activities, contact your local county extension service office.

# Financial Managers

(O*NET 13002A and 13002B)

**Significant Points**

- A bachelor's degree in finance, accounting, or related field is the minimum academic preparation, but many employers increasingly seek graduates with a master's degree and a strong analytical background.
- The continuing need for skilled financial managers will spur average employment growth.

**Nature of the Work**

Almost every firm, government agency, and organization has one or more financial managers who oversee the preparation of financial reports, direct investment activities, and implement cash management strategies. As computers are increasingly used to record and organize data, many financial managers are spending more time developing strategies and implementing the long-term goals of their organization.

The duties of financial managers vary with their specific titles, which include chief financial officer, vice president of finance, controller, treasurer, credit manager, and cash manager. *Chief financial officers* (CFOs), for example, are the top financial executives of an organization. They oversee all financial and accounting functions and formulate and administer the organization's overall financial plans and policies. In small firms, CFOs usually handle all financial management functions. In large firms, they direct these activities through other financial managers who head each financial department.

*Controllers* direct the preparation of financial reports that summarize and forecast the organization's financial position, such as income statements, balance sheets, and analysis of future earnings or expenses. Controllers are also in charge of preparing special reports required by regulatory authorities. Often, controllers oversee the accounting, audit, and budget departments. *Treasurers* and *finance officers* direct the organization's financial goals, objectives, and budgets. They oversee the investment of funds and manage associated risks, supervise cash management activities, execute capital-raising strategies to support a firm's expansion, and deal with mergers and acquisitions.

*Cash managers* monitor and control the flow of cash receipts and disbursements to meet the business and investment needs of the firm. For example, cash flow projections are needed to determine whether loans must be obtained to meet cash requirements or whether surplus cash should be invested in interest-bearing instruments. *Risk*